

CSPR Briefing

Baltic Climate Vulnerability Assessment Framework: Introduction and Guidelines

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Centre for Climate Science and Policy Research

The Centre for Climate Science and Policy Research is a joint venture between Linköping University and the Swedish Meteorological and Hydrological Institute. We conduct interdisciplinary research on the consequences of climate change as well as measures to mitigate emissions of greenhouse gases and ways to adapt society to a changing climate. Producing effective climate strategies presupposes that the climate issue is studied in its context with other measures for sustainable development, therefore the Centre also undertakes research on related environmental and resource issues. Our research spans international and global as well as Swedish conditions.

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To Whom it may concern

This Vulnerability Assessment Framework was put together within the project **Baltic Challenges and Chances for local and regional development generated by Climate Change** financed by the European Regional Development Fund and the Baltic Sea Region Programme 2007-2013. The purpose of the framework is to guide and assist the Target Areas (TA) within the project in mapping and analysing the challenges and chances created by climate change. The Vulnerability exercises have originally been developed and tested within a number of other research projects within the Key Research Area *Vulnerability & Adaptation* at the Centre for Climate Science and Policy Research (CSPR). The projects **Enhancing Cities' Capacity to Manage Vulnerability to Climate Change** (financed by FORMAS), **Participatory Modelling for Assessment of Climate Change-impacts on Water Resources in Southern Africa** (financed by SIDA/Sarec), and the **Swedish Research Programme on Climate, Impacts and Adaptation** (financed by MISTRA) are the most important and we acknowledge the sharing of results made possible by those financing agencies. Apart from the authors, the following persons have contributed to the design of individual exercises: Lotta Andersson, Yvonne Andersson-Sköld, Karin André, Åsa Gerger-Swartling, Erik Glaas, Anna Jonsson and Louise Simonsson. These people all have been generous to share their expertise and are gratefully acknowledged. We are also grateful for all stakeholders that by their participating in the exercises have helped us in developing them. Please refer to any individual exercise use according to the following example: André, K. and Å. Gerger-Swartling, 2010. *Exercise VI – Identification of Key Actors and Mapping of their Responsibilities*. In Hjerpe and Wilk, 2010. *Baltic Climate Vulnerability Assessment Framework: Introduction and Guidelines*. CSPR Briefing No 5. 2010.

At the time of publishing, results based on the methods described in this briefing have still not been published and are still work in progress. The exercises are in a process of modification and adjustment, both within the Baltic Climate project and other initiatives. If you wish to use any of these exercises, please contact Mattias Hjerpe or Julie Wilk at CSPR. The Briefing in an earlier version was primarily intended for use in regional and local applications in the Baltic Sea Region starting December 2009 and forward. Any suggestions for improvement and tests of the VAF pilot version will be of pertinent importance to develop the final version.

This Briefing consists of three sections and one appendix.

Section 1 “*Introducing Vulnerability to Climate Change*” describes the main elements in an assessment of vulnerability to climate variation and climate change. It intends to familiarize project participants within the vulnerability assessment process in the TAs.

Section 2 “*BalticClimate Vulnerability Assessment Framework*” presents the VAF and explains the idea of using exercises to systematically discuss the main elements shaping vulnerability to climate change in your TA. It also presents how the WP3 researchers can support the TAs.

Section 3 “*Exercises for analysis of vulnerability and adaptation*” contains the aims, outputs, and description of the eight exercises, and the exercises Identification of Challenges & Chances of Climate Change and Introducing Climate Adaptation undertaken during the Inventory phase. The appendix contains a more elaborated description of adaptation and vulnerability to climate change.

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1. Introducing Vulnerability to Climate Variability and Change

Climate Mitigation and Adaptation

The two basic categories of policy responses to anthropogenic climate change are mitigation and adaptation (Füssel and Klein 2006, Stehr and von Storch 2006). Mitigation policy options aim at limiting climate change by reducing GHG emissions and enhancing so-called GHG sinks. Adaptation policy options mainly strive to diminish the negative effects of climate change by establishing a broad range of policies and measures targeted at the vulnerable system, i.e. change in human systems in response to actual or expected climate change (McCarthy et al. 2001). Adaptation also often includes policies and measures undertaken to seize new opportunities that may have arisen as a result of climate change. More information on mitigation and adaptation plus a table outlining the main differences between them (Table 1) can be found in Appendix 1.

Vulnerability to Climate Variability and Change

There are three major approaches or mental models on vulnerability to climate change (Füssel and Klein 2006).

The first one, which is often used by spatial planners, engineers and the natural hazard community, frames vulnerability as the risk that a certain event will occur. Risk is thus defined as the product of probability and consequence (e.g. Brooks 2003, Füssel and Klein 2006). This is called the **risk-hazard approach** and it mainly relates to sensitivity, that is how significantly climate change will impact society and nature.

The second approach is called the **social constructivist approach** and it has its origins in human geography and political economy (Adger 1999). Here, vulnerability is seen as a condition of a household or a local community that is assumed before the real analysis starts. This condition is determined by socio-economic and political factors (Adger and Kelly 1999) thus underlining the non-climatic drivers of change that affect social systems.

The third approach frames **vulnerability as an integrated measure** and is prominent in studies of global change. The IPCC in its third assessment report defined vulnerability in an integrated manner as “*the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change*”, and it is seen as a function of “*the character, magnitude, and rate of climate change and variation to which a system is exposed and the sensitivity and adaptive capacity of that system*” (McCarthy et al. 2001). Accordingly, vulnerability contains an external dimension, that is the exposure to environmental and economic change determined outside the local community, and an internal dimension capturing sensitivity and adaptive capacity of the local community to these mainly externally determined stressors.

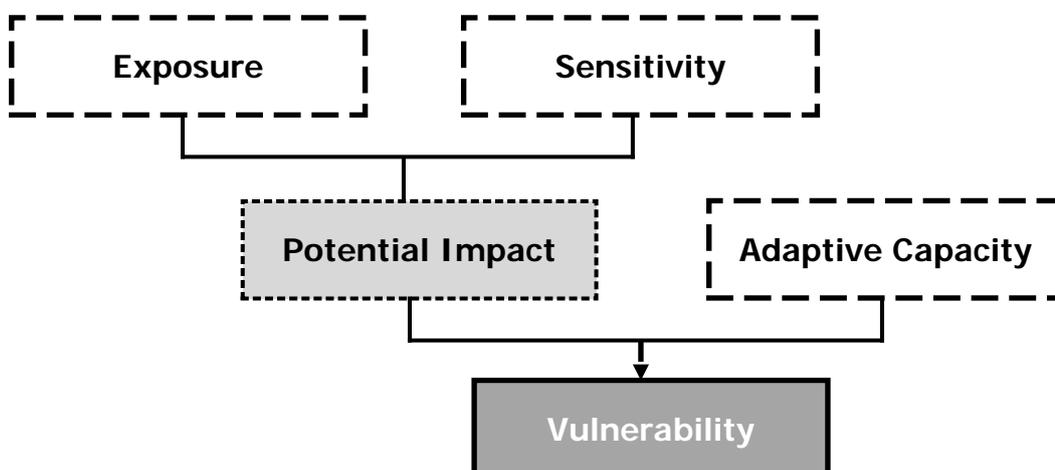


Figure 1. Vulnerability and its components (Source: Australian Greenhouse Office 2005).

Approach for BalticClimate

During the vulnerability assessment phase of BalticClimate, the three inter-related elements of the IPCC definition of vulnerability will serve as a basis. They are: exposure, sensitivity, and adaptive capacity. Exposure and sensitivity are hard to separate in a system. *Exposure* represents what risks the local community is facing and how much a system is stressed, while *sensitivity* addresses how much these stressors actually modify or affect the studied system. *Adaptive capacity* depicts the ability of a system to adjust to climate change in order to moderate potential damages, take advantage of opportunities, or cope with the consequences (McCarthy et al. 2001). For more in-depth descriptions of these elements, see Appendix 1.

In the BalticClimate project, we have made three important additional assumptions that underline our work.

First, vulnerability to climate change is mainly about climate adaptation issues. In BalticClimate both adaptation and mitigation policy instruments and measures will be analysed and discussed. This can enable the opportunity to seize synergies between the two (Klein et al. 2005).

Second, climate change can create both negative and positive effects. Since BalticClimate will assess both of these, the elements of Chance will be emphasized throughout project activities.

Third, vulnerability to climate change is not an isolated phenomenon but rather is highly linked with socioeconomic change (Adger 1999, Adger and Kelly 1999, Leichenko and O'Brien 2002). Studies have documented that non-climatic factors often are more important than the climatic ones; particularly for determining how to guide decision making on adaptation (Wandel and Smit 2000). This is captured by the concept double or multiple exposures (O'Brien and Leichenko 2000, Leichenko and O'Brien 2008). In BalticClimate this is explicitly incorporated by looking both at how the most decisive climate *and* non-climatic stressors influence local conditions.

2. BalticClimate Vulnerability Assessment Framework

The Vulnerability Assessment Framework that we will use in BalticClimate is depicted in figure 2. In addition to the three key elements of integrated vulnerability, it contains mitigation and adaptation options. Our objective is to realistically estimate the vulnerability of the Implementation Case themes in the Target Areas to climate variability and change in order to identify key challenges and chances. Vulnerability is analysed, in concert with other stressors as well as the potential of feasible adaptation and mitigation policies and measures that could be employed to reduce the negative impacts of climate variability and change. We recognize that it is not only the existence of adaptation measures that limits climate vulnerability, but also and more importantly, the capacity of social organisations – households, businesses, public agencies - to put these measures into practice. It is this implementation deficit that needs to be recognized, discussed and, hopefully, overcome. Consequently, the BalticClimate VAF aims to facilitate prioritization of adaptation and mitigation policies and measures through a systematic analysis of climatic and non-climatic stressors, and how these stressors affect the exposed units, i.e. (the Target Areas or the specific Implementation Case themes).

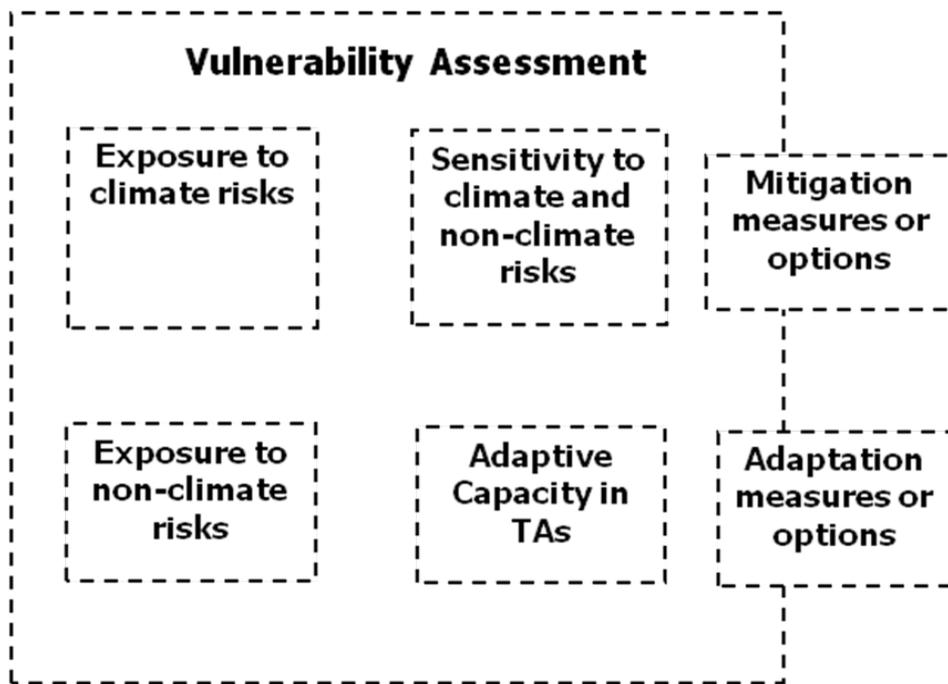


Figure 2. The main elements in the BalticClimate Vulnerability Assessment Framework.

The Vulnerability Assessment Framework Process

The VAF will provide a wider frame for interpretation of the implementation cases that you have selected for each TA. By conducting the series of exercises you will systematically identify and address the main climatic and non-climatic challenges and chances, the sectors and activities most affected, and the barriers and facilitating factors that hinder and encourage adaptation to and capitalization of these challenges and chances. The activities undertaken during the Inventory phase will facilitate your work during the vulnerability assessment and the results will be used as input in several of the exercises.

The vulnerability assessment process consists of eight exercises and in-depth analysis based on the critical issues identified by these exercises. Each exercise emphasizes a key issue for assessing vulnerability to climate change and climate adaptation. Each TA will decide which of the exercises

they will undertake. The CSPR team is prepared to contribute with analytical support, at the request of the TAs. The team can also assist in either connecting the TA with suitable analytical capacity to undertake these in-depth studies or perform them, if the TA allocates funds for this purpose.

Steps of the Vulnerability Assessment Phase

1. **Select a Process Leader.** This person should preferably be the contact person in each TA, unless you decide otherwise. The Process Leader prepares the exercises and guides the discussions at the meetings.
2. **Select Exercises and make a Time Plan.** Decide which exercises and when you plan to do them. The exercises are described in section three. The time plan should contain: Which exercises you want to do? When you will do them? Who will be Process Leader and Rapporteur? Which implementation case themes will you specifically address? What problems and need for process support do you expect? What need for in-depth studies or analytical support do you expect? Send this information to the CSPR team, who will send you detailed instructions on how to carry out the chosen exercises. It is easiest to carry out the exercises in order I – VIII so we encourage you to use that chronology. Since you will probably not do all exercises, the Process Leader will need to guide discussions on how to gather information about the issues that are not covered in the exercises that you conduct.
3. **Plan the exercises carefully.** By following the detailed instructions you should be able to plan and successfully carry out each exercise. Please consult CSPR if you encounter any difficulties.
4. **Appoint a Rapporteur.** This person will document the discussions and results of the exercises. This position could rotate during the Vulnerability Assessment phase. For each exercise, there is a specific output format. The output should be recorded in the Targetbook on the Communication Portal (see the section below on Documentation). The CSPR team will offer comments and feedback on your output.
5. **Evaluate** the usefulness and format of each exercise (See the section below on Evaluation). Bearing in mind that BalticClimate aims to develop useful tools for analysing challenges and chances of climate change at local level all around the Baltic Sea area, your comments will be crucial to further developing the VAF and the support material needed to perform such an analysis.

Time Plan

Each TA should fill in the table below and submit it to CSPR as soon as possible (**latest by January 13th 2010**) in order to enable the CSPR team to send you the detailed instructions for each exercise. Table 1 is sent to you as a separate word file.

Table 1: Time plan

Target Area:	
Implementation case themes:	
Process Leader:	
Rapporteur(s)	
We plan to conduct the following exercises:	When we plan to conduct the selected exercises:
Exercise I - How might future society be?	
Exercise II - Climatic Stressor Mapping	
Exercise III - Socioeconomic Stressor Mapping	
Exercise IV - Analyzing socioeconomic sensitivity	
Exercise V - Identifying and Ranking Adaptive Capacity	
Exercise VI - Identification of Key Actors and Mapping of their Responsibilities	
Exercise VII - Limits of Adaptation measures	
Exercise VIII - Integrated Vulnerability Assessment	
Expected need for process support	
Expected need for analytical support	

Documentation of exercises

To record your own process in the TA and the work with the Implementation Cases, you will record the results obtained from each exercise in your Targetbooks. We also recommend that you take photos of the final product of each exercise and put it on the Communication Portal. In cases where camera documentation is difficult for various reasons, we instead recommend that you record the outcome in a table. Microsoft Excel can be used for that purpose.

Evaluation of the exercises

The exercises in the VAF have mainly been developed and used by researchers at CSPR in a number of research projects. The design of the exercises, with regards to both their format and analytical content is still under development. BalticClimate users are doing test runs with these techniques, and are as such a valuable resource in the process of refining the exercises. At the conclusion of the BalticClimate project, a modified version will be made available for use in local areas around the Baltic Sea. To aid this work, we request you to evaluate each exercise after you completed it. The Process Leader can use the following questions to structure the evaluation:

- a. How relevant was the focus of the exercise?
 - i. For your TA or Implementation Case theme
 - ii. For the group of people that participated in the exercise (please state briefly what types of competences/positions that were present in the group)
- b. How relevant was the output of the exercise? Could it be applied in your day to day work? Did it widen the perspectives of the participants? Neither of this?
- c. How well did the analytical structure of the exercise contribute to making the outcome relevant and usable? Suggestions for changes?
- d. How well did the charts, images, concepts and other materials used during the exercise help in facilitating the analytical and creative thinking of participants?

Make the evaluation by brief notes on each issue, or mark in the following chart, by the group as a whole, or by each individual participant. The Process Leaders may also prepare their own evaluation questions!

	☹	:-I	☺	Comments:
a) i				
a) ii				
b)				
c)				
d)				

3. Exercises for analyzing vulnerability and adaptation

This section contains the aims, outputs and a short description of the exercises that make up the Vulnerability Assessment Framework:

- Exercise I - How might future society be?
- Exercise II - Climatic Stressor Mapping
- Exercise III - Socioeconomic Stressor Mapping
- Exercise IV - Analyzing socioeconomic sensitivity
- Exercise V – Identifying and Ranking Adaptive Capacity
- Exercise VI – Identification of Key Actors and Mapping of their Responsibilities
- Exercise VII – Limits of Adaptation measures
- Exercise VIII – Integrated Vulnerability Assessment.

The full description on how to make the two exercises that were conducted at Transnational Seminar 1 in Gävle, Sweden and during the Introductory Phase, are presented in the final part of this section. These exercises are:

- Exercise A – Identification of challenges and chances, and
- Exercise B – Introducing Climate Adaptation

Exercise I – How might future society be?

Designed by Julie Wilk and Mattias Hjerpe

Aim:

This exercise aims at creating a socio-economic scenario that is a coherent picture of how future society might be in the TA or in the implementation cases.

Output:

One plausible Target Area scenario, including the major drivers of change and other general features. This scenario will be used to analyze sensitivity in Exercise IV. You will also relate the Target Area socioeconomic scenario to the Maps that were created during the Urban Structure Inventory.

Description:

This exercise uses the summary characteristics of the IPCC Special Report on Emissions Scenarios (SRES) as a basis for a discussing how participants think the future society might be both globally and in the TA. The summary characteristics of 4 SRES storylines are contained in figure 3. These scenarios are used as a basis for estimating the future GHG emissions and consequently are vital inputs to determining the magnitude of climate change impacts.

You select what you think is the most plausible of these four scenarios. You will then modify this scenario by discussing how you think the key features will influence the TA or implementation theme. Make use of the challenges and chances that were identified in Gävle exercise A.

Economic emphasis →		
Global Integration →	A1 storyline <u>World:</u> market-oriented <u>Economy:</u> fastest per capita growth <u>Population:</u> 2050 peak, then decline <u>Technology:</u> three scenario groups: Fossil-intensive, non-fossil energy sources, balanced across sectors	A2 storyline <u>World:</u> differentiated <u>Economy:</u> regionally oriented; lowest per capita growth <u>Population:</u> continuously increasing <u>Technology:</u> slowest and most fragmented development.
	B1 storyline <u>World:</u> convergent <u>Economy:</u> service and information-based; lower growth than A1 <u>Population:</u> 2050 peak, then decline (same as A1) <u>Technology:</u> clean and resource-efficient	B2 storyline <u>World:</u> local solutions <u>Economy:</u> intermediate growth <u>Population:</u> continuously increasing at lower rate than A2 <u>Technology:</u> more rapid than A2, less rapid but more diverse than A1 and B1
← Environmental emphasis		

Figure 3. Summary characteristics of the four SRES storylines. Source: Parry et al. (eds.) 2007.

Exercise II - Climatic Stressor Mapping

Designed by Yvonne Andersson-Sköld and Erik Glaas

Aim:

This exercise aims at selecting the most critical climatic stressors and chances that affect vulnerability and adaptation in the TA (at societal level) and for each implementation case (specifically). The exercise is preferably done in tandem with Exercise III.

Output(s):

There are two major results from this exercise: (1) A list of how the most significant climatic stressors and chances affect vulnerability to climate change in the TA or implementation case. (2) Identification of information or in-depth studies on more specific climatic impacts, stressors or chances required to be able to assess vulnerability. The climatic stressors will be used, together with the socioeconomic stressors and chances identified in Exercise III, when identifying sensitive activities and sectors in the TA. The climatic stressors are recorded in the Targetbook.

Description:

This exercise departs from Gävle exercise A: Identification of challenges and chances of climate change. First you will focus on climatic stress, that is what risks the TA is facing and how these affect TA activities. Important questions to answer will be how much (magnitude), how often (frequency), for how long (duration), and where (spatial extent) these stresses occurs. You will select the most critical climatic stressors from the Gävle exercise list and by using the climate support material sent out during the Inventory phase plus all relevant climate data you collected during the Inventory phase. You then continue to select the most promising chances. The results, together with possible in-depth studies on impacts, will serve as inputs to the sensitivity discussions in Exercise IV.

Exercise III - Socioeconomic Stressor Mapping

Designed by Mattias Hjerpe

Aim:

This exercise aims at selecting the most critical socioeconomic stressors and chances in the TA and for each implementation case.

Output:

There are two major results from this exercise: (1) A list of how the most significant socioeconomic stressors and chances affect vulnerability to climate change in the TA or implementation case. (2) An elaborated description in-depth information or studies on more specific socioeconomic impacts, stressors or chances required to be able to assess vulnerability. The socioeconomic stressors will be used, together with the climatic stressors and chances identified in Exercise III, when identifying sensitive activities and sectors in the TA. The climatic stressors are recorded in the Targetbook.

Description:

The exercise is based on a questionnaire containing a list of economic, social, demographic and technological factors and in what direction you think that they will evolve in the future. The socioeconomic factors have been identified in other studies, and in national surveys of the major socioeconomic problems. Each participant fills in the questionnaire before the meeting. The group discusses each factor and selects the gravest ones based on the overall results and the direction of future change. Next, you compare the selected factors with the TargetArea scenario obtained in exercise I in order to identify the major socioeconomic challenges, and in what ways it is connected

to climate change. As a next step you go through the same steps but with the chances created by socioeconomic change.

Exercise IV – Analyzing Socioeconomic Sensitivity

Designed by Mattias Hjerpe

Aim:

This exercise aims at analyzing which economic sectors, societal activities, and social groups in the TA or in the Implementation Case themes will be most influenced by the most critical climatic and socioeconomic stressors and chances.

Output:

A list of either how the most sensitive sectors, activities and social groups in the TA are effected by climate and socioeconomic impacts or how the Implementation Case themes are effected by climate and socioeconomic impacts. These lists are labeled and drawn on the Urban Structure Maps, if applicable.

Description:

Many studies have demonstrated that local experiences provide very specific descriptions of how economic sectors, societal activities, and social groups are affected by current climate variability. This can serve as a very good indicator of how the impacts of future climate change might influence various sectors and activities. Studies have also shown that sensitivity has many dimensions such as spatial, socioeconomic, and administrative.

In this exercise you use the Target Area socioeconomic scenario and the lists of climatic and socioeconomic stressors to: (i) either systematically rank how different economic sectors and societal activities in the TA are influenced by climate change, (ii) or to rank how the implementation case theme is influenced by climate change.

The exercise thus seeks to answer at what point the climate and socioeconomic impacts turn into a threat or which of the impacts that are expected to be critical to handle to mitigate the negative or seize the positive consequences of a changing climate and society. If you have not done Exercise I, II or II you will select one of the SRES storylines (see Exercise I) to help you identify sensitive sectors and activities. This will require some time for preparation.

Exercise V – Identifying and Ranking Adaptive Capacity

Designed by Anna Jonsson, Louise Simonsson and Mattias Hjerpe

Aim:

This exercise aims at identifying and ranking both internal and external factors of adaptive capacity in order to single out the most relevant ones for assessing vulnerability to climate change in the Implementation Cases and in the TAs.

Output:

A list of the most influential factors, both external and internal ones, affecting adaptive capacity for each Implementation case theme. Outcomes are both areas where special attention is needed, and strengths in the TA adaptation capacity. These will be used in the assessment of overall vulnerability, and they will also be important for Exercise VII - Limits of adaptation measures.

Description:

Using the IPCC definition of Adaptive Capacity “depicts the ability of a system to adjust to climate change to moderate potential damages, to take advantage of opportunities, or to cope with the consequences” participants first identify and then rank factors of adaptive capacity according to their importance and possibility to change. This results in a comprehensive description of the barriers and opportunities for climate adaptation, both in terms of meeting the challenges and seizing the opportunities.

Exercise VI – Identification of Key Actors and Mapping of their Responsibilities

Designed by Karin André and Åsa Gerger-Swartling

Aim:

This exercise aims at mapping division of responsibility across the key actors who are involved in climate change governance for the TA in general and in each of the Implementation Case themes, in terms of: (i) crisis management, (ii) more long-term planning, and (iii) seizing opportunities.

Output:

A map of key actors, according to their importance for making climate adaptation and mitigation happen, and for seizing the opportunities, their adaptive capacity and how much they interact in climate change governance to be recorded in the Targetbook.

Description:

Participants use the results from the Stakeholder mapping and the list of existing planning documents/instruments that was compiled during the Inventory phase. They rank these key actors in terms of adaptive capacity, importance for climate adaptation, mitigation, and for seizing opportunities as well as degree of interaction with other stakeholders. The exercise looks at formal and informal responsibility and identifies responsibility gaps that risk impeding climate adaptation and mitigation.

Exercise VII – Limits of Adaptation Measures

Designed by Julie Wilk

Aim:

This exercise aims at identifying and understanding the factors that limit adaptation measures and mitigation potential. Once you have identified which measures that can help you meet the identified threats or seize the opportunities, and who will bear the responsibility for planning, implementing, and maintaining/monitoring them, the main barriers that diminish adaptive and capitalization capacity will be outlined.

Output:

A list of Barriers to implementation of adaptive and capitalization measures to the main challenges and chances in the Implementation Cases and Concrete Means to meet and overcome those barriers.

Description:

This exercise uses the results from the exercises on sensitivity, adaptive capacity, division of responsibility as well as the Gävle exercise B: Introducing climate adaptation. If you have not conducted any of these exercises, please prepare a discussion at the meeting in which you make a rapid appraisal of the parts that you are missing. This exercise continues to map adaptive capacity by concentrating on the factors that limit or enable making appropriate responses to the various effects of climate change. You will chart and address issues of co-benefits, conflicts of interests, financing opportunities and hurdles, responsibility, maintenance, etc. Once you have mapped the limitations, you will outline specific ways to tackle and overcome these hurdles.

Exercise VIII – Integrated Vulnerability Assessment (under preparation)

Designed by Anna Jonsson, Julie Wilk and Louise Simonsson

Aim:

This exercise will summarize the results from the previous exercises in a way that assess the TA's vulnerability in an integrated way. The integration will be made both in terms of the three key elements of vulnerability to climate variation and change: exposure, sensitivity, and adaptive capacity, and across the implementation case themes. This will enable you to identify areas (spatial and organizational) of special concern, areas where vulnerability is relatively low, and areas where there are good opportunities to capitalize.

Output:

Pentagram, bar diagram or similar with a qualitative ranking of the outcomes of the exercises grouped into exposure, sensitivity and adaptation capacity. The outcomes from the other exercises will be in the form of various short lists.

Description:

The first step contains a validation of the output formats that were obtained for the exercises you already have conducted as well as a rapid appraisal for the exercises that you did not select. The second step analyses these results across exposure, sensitivity, and adaptive capacity. The third step analyses the results across implementation themes.

Exercise A - Risk Identification – Challenges and Chances

Adapted from earlier work by Lotta Andersson, Karin André, Louise Simonsson and Julie Wilk

Aim:

This exercise aims at systematically ranking the challenges and chances of climate change for each Implementation case (e.g. Transport, Housing, Agriculture, and Energy) according to their importance and time.

Output:

Challenges and chances for each Implementation Case in tables (on flip charts). These challenges and chances should be documented in the Targetbooks, and they are a good introduction to the exercises on stressor mapping and sensitivity.

Description:

The exercise should be performed for each Implementation Case (e.g. Transport, Housing, Agriculture and Energy), one by one.

- Start with one of the Implementation Case themes, write down the main future challenges that you face within this sector on small pieces of paper. Work individually and silently.
- Place the papers containing challenges on the flip-chart sized paper according to: (see below): (1) size of the challenge, i.e. how big are the impacts on the Sector? (2) when will this challenge occur, i.e. current, all the time, in the future, specific points in time (such as a crisis)? Explain challenges that are unclear.
- After the challenges have been placed, identify the ones that are specifically climate-related. Mark these with red colour. Please record the reason why.
- Add any more challenges that are climate-related.
- Repeat the same exercise but this time for Chances instead of Challenges.
- Repeat the same exercise for the other Implementation Case themes.
- Evaluate the exercise.
- Send copies of the documentation to CSPR.

Preparation:

Prepare flip chart sized papers according to the figure below. Two for each Implementation Case sector (one for challenges and one for chances). Divide the paper into 5 sections both horizontally and vertically. This facilitates documentation in your Targetbooks.

SIZE OF CHALLENGE	Big					
	Small					
		TIME SCALE				

Horizontal axis: Time scale. The actual time should be filled in by the participants according to the challenges they identify (e.g. 2009 to 2020 or 2050 or 2100)

Vertical axis: Small to Big according to size of the challenge.

Material: Red marker, small pieces of paper (Post-It or similar)

Exercise B - Introducing Climate Adaptation

Designed by Lotta Andersson and Julie Wilk

Aim:

This exercise introduces participants to climate adaptation by listing and ranking policy instruments and adaptive capacity. Adaptive capacity here is approached through identification of the main barriers and facilitating factors for putting the climate adaptation measure into place. At this point in time, policy instruments should be approached in a wide sense, embracing policy and economic instruments as well as concrete technical measures but focus on the ones that already are in place or is planned in the near future.

Output:

Lists of current Policy Instruments, barriers and facilitating factors for each of the major challenges and chances that were identified during Exercise A – Identification of challenges and chances. The exercises on adaptive capacity and adaptation measures will use these results as input in wider and more in-depth assessments. These charts should be recorded in your Targetbooks.

Description:

To get a picture of climate adaptation in the Implementation Case themes or in the TA in general, take the largest challenge from Exercise A.

- Try to answer the following questions (fill in the charts):
 1. What policy instruments are already in place to handle this challenge or to utilise the chance?
 2. What are the barriers that hinder putting measures in place or taking advantage of the chances?
 3. What factors can facilitate the handling of the challenges or to take advantage of the chance?
 4. Rank from 1-5 from how easy (1) to how difficult (5) it will be to handle the challenge or to take advantage of the chance?
- Repeat steps 1-4 for the rest of the major challenges.
- Then repeat the exercise, but this time for the chances.
- Evaluate the exercise.
- Send copies of the charts to CSPR.

Preparation

Make empty charts as below. Write down the 3-4 major challenges and chances that were identified during Exercise A.

Challenge	Policy Instruments in Place	Barriers	Facilitating factors	Easy/Difficult
1				
2				
3				

Chance	Policy Instruments in Place	Barriers	Facilitating factors	Easy/Difficult
1				
2				
3				

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Appendix 1: Vulnerability Assessments

Research on climate vulnerability assessments and adaptation strategies often “mirror the common assumptions of the policy development process” (Grothman and Patt 2005) as a series of rational steps, for instance information collecting and awareness building, planning and design, implementation and monitoring (Klein et al. 1999). However, it is well-known that decision-making is not a unidirectional and sequential process, and it has been demonstrated that it is chaotic and strongly connected to power structures and political behavior. Consequently, climate vulnerability assessments should be based on a better understanding of decision-making processes and cognitive issues, such as risk perception and perceived adaptive capacity (Grothmann and Patt 2005). The participatory BalticClimate VAF is based on such premises.

Adaptation

Currently there is a lot of interesting results coming out from climate adaptation studies. Burton et al. (2006) synthesized the results from several local case studies on climate adaptation and identified nine lessons that had been learnt: Adapt now, Adaptation is development, Adaptation is for ourselves, International financial help is necessary, Strengthen institutions, Involve those at risk, Use sector-based approaches, Expand information, awareness and technical knowledge, and Adaptation is place-based. Several of these lessons have been incorporated in the participatory VAF used in BalticClimate.

Mitigation

In addition to the characteristics listed above, climate mitigation policy options suffer from something known as a prisoner’s dilemma. To create effective mitigation, many actors at the global level must reduce emissions. If only a few lower their emissions, the impacts or benefits will be small. There is also uncertainty about the magnitude and pace of GHG reductions that are required to halt the progression of global temperature rise. The most stringent of the six stabilization scenarios assessed by the Intergovernmental Panel on Climate Change (IPCC) in the fourth Synthesis Report, requires a concentration of between 445 to 490 ppm of CO₂-eq in the atmosphere (IPCC 2007) in order to limit temperature increase to 2°C. To achieve this, GHG emissions have to peak in 2015 at the latest and then decrease dramatically by 50 to 85 % compared to 2000 levels until 2050. Even if GHG concentration is stabilized at a higher level, significant emission reduction is still required.

Table 1. Main differences between Climate Adaptation and Mitigation policy options (Source: Füssel and Klein 2006).

	Mitigation of climate change	Adaptation to climate change
Benefited systems	All systems	Selected systems
Scale of effect	Global	Local to regional
Life time	Centuries	Years to centuries
Lead time	Decades	Immediate to decades
Effectiveness	Certain	Generally less certain
Ancillary benefits	Sometimes	Mostly
Polluter pays	Typically yes	Not necessarily
Payer benefits	Only little	Almost fully
Monitoring	Relatively easy	More difficult

The three key elements of Vulnerability

The first two elements of vulnerability - *exposure* and *sensitivity* - are hard to separate in a system. They are determined by the interaction between the characteristics of system and the impacts from the climatic stresses (Smit and Wandel 2006).

Exposure represents what risks the local community is facing and how much a system is stressed. The severity of the stress is often measured by how much (magnitude), how often (frequency), for how long (duration), and where (spatial extent) a climatic event occurs. A system is never exposed only to the climate stimuli, even though it for analytical purposes can be convenient to look at it this way. By not taking multiple stressors into account, there is a risk to systematically underestimate vulnerability. But by incorporating other stressors, you lose in analytical power. There is accordingly a balance here. We have seen that it in practical applications, however, is best to map what other factors create challenges and chances. This mapping creates a basis for interpretation or shapes the context from which vulnerability should be assessed. More focussed risk-assessments could then be analysed using this multi stressor context.

Double or multiple exposure analyses how various global processes actually affect conditions and shape the room for action at the local level (O'Brien and Leichenko 2000). The framework takes into account both the effects of climate change and economic globalisation. When applying the framework, accordingly, the most relevant climatic and non-climatic stressors are identified. The socioeconomic processes that make up the non-climatic stressors are usually divided into economic, political, technological, and demographical processes of change.

The *sensitivity* element addresses how much the stressors actually modify or affect the studied system. A sensitivity analysis of the sectors or areas that are most significantly affected by climate change is usually conducted as a part of the vulnerability assessment. Recently it has been suggested that economic sectors not always are the best analytical perspective for analysing sensitivity.

Climate adaptation is inherently an inter-sectoral issue and the variability within each sector is larger than across sectors. Accordingly, sensitivity should be addressed directly towards the "critical" issues such as certain social and demographic groups or areas. Studies have shown that by doing so, more elaborate descriptions on how climate variation affect society today are obtained, and based on these descriptions you get a more comprehensive picture on how climate change may affect in the future. It is also important to study the drivers that affect sensitivity of the local area. For instance, in Sweden, concentration of population to a few economic centers mostly situated in coastal areas increase sensitivity to flooding. If no adaptation is undertaken, vulnerability will increase.

The third element, *adaptive capacity*, depicts the ability of a system to adjust to climate change in order to moderate potential damages, take advantage of opportunities, or cope with the consequences (McCarthy et al. 2001). This includes issues of social capital, governance and coping experience; i.e. the role of institutions. There is an external and internal approach to adaptive capacity (Smit and Wandel 2006).

The external approach assumes that adaptive capacity is mainly determined by factors lying outside the control of the system. These studies often compare the relative adaptive capacity of nations, regions or localities based on statistical analysis of a multi-variable index.

In contrast, internal analyses are made at the micro level looking at how various types of organisations govern climate adaptation and how to enhance social learning from these practical experiences. Lack of national legislation and rules, ambiguous division of responsibility, unaccustomedness to cooperate across departments and with non-public stakeholders, insufficient capacity to interpret analytical material, and too informal, fragmented and arbitrary documentation of experiences (Storbjörk 2007, Glaas et al. forthcoming) all have been identified as barriers to enabling climate adaptation. The BalticClimate framework combines the external and internal approaches by systematically addressing adaptive capacity from both these viewpoints.